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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,162	03/25/2004	Raquel Tato	282747US8X	7741

22850 7590 06/12/2007

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EXAMINER	
RIDER, JUSTIN W	

ART UNIT	PAPER NUMBER
2626	

NOTIFICATION DATE	DELIVERY MODE
06/12/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/809,162	TATO ET AL.	
	Examiner	Art Unit	
	Justin W. Rider	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03/2004 (1 Sheet)*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to communications: Application filed 25 March 2004. Claims 1-16 are pending.

Information Disclosure Statement

2. The information disclosure statement(s) (IDS) submitted on 25 March 2004 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the examiner has considered the information disclosure statement(s).

Specification

3. The abstract of the disclosure is objected to because it is too lengthy. Applicant is reminded that the abstract should be no longer than 150 words. Correction is required. See MPEP § 608.01(b).

Claim Objections

4. Claim 15 is objected to because of the following informalities:

Claim 15, line 2, 'program means adapted to' should be stated more appropriately, such as --program means to--. Phrases including: 'can', 'might', 'are configured', 'are assignable', and 'is connectable' among others, merely recite the ability of cases to occur, but do not explicitly require them to do so. They fail to claim a positive recitation of the interconnectivity of all elements of a system. The above are merely examples and do not necessarily represent every instance of objectionable matter within the claims.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 1-6, 9, 11-12 and 14-16 are rejected under 35 U.S.C. 102(a) as being anticipated by **Ming et al. (WO 02/095730 A1)** referred to as **Ming** hereinafter.

Claim 1: **Ming** discloses a method for pre-processing speech comprising the steps of:

i. receiving a speech signal (S) (p. 37, line 16, *'For clean speech input, this model produced... '*);

ii. separating a spectrum (F) of said speech signal (S) into a given number (N) of predetermined frequency sub-bands (F_1, ..., F_N) (p. 3, lines 7-8, *'In this approach, the full speech frequency band is divided into several sub-bands, '*);

iii. analyzing [featuring, extract feature] said speech signal (S) within each of said frequency sub-bands (F_1, ..., F_N) (p. 5, lines 23-26, it is inherent that if an invention is based on interpreting features on an input signal, that the input signal is analyzed to perform operations on said signal (sub-band) (e.g. analyze, interpret, extract features, compare to other signal segments, etc...)).;

iv. thereby generating respective band-dependent acoustic feature data (O_1, ..., O_N) for each of said respective frequency sub-bands (F_1, ..., F_N), which band-dependent acoustic feature data (O_1, ..., O_N) ,are at least in part representative for said speech signal (S) with respect to a respective frequency sub-band (F_1, ..., F_N) (p. 7, line 23 - p. 8, line 2);

v. deriving band-dependent likelihoods (b_1, ..., b_N) for occurrences of speech elements (PI, ...,Pm) or of sequences thereof within said speech signal (S) based on said band-dependent acoustic feature data (O_1, ..., O_N) and/or a derivative thereof (p. 8, lines 13-20);

vi. analyzing said speech signal (S) within said entire spectrum (F) (p. 24, lines 10-13, *'Based on these log filter-bank spectra, both the full-band features and sub-bands features were calculated. The full-band features were used for comparison, '*);

vii. thereby generating full-band acoustic feature data (FBE-F; FFBE; FBE-F-SSUB; $O_{F,SSUB}$), which are at least in part representative for said speech signal (S) with respect to said entire spectrum (F) (p. 24, lines 10-13, *'Based on these log filter-bank spectra, both the full-band features and sub-bands features were calculated. The full-band features were used for comparison, '*);

viii. deriving a full-band likelihood (B_{FF}; B_{SSUB}) for occurrences of speech elements (Pl, ..., Pm) or of sequences thereof within said speech signal (S) based on said full-band acoustic feature data (FBE-F; FFBE; FBE-F-SSUB; $O_{F,SSUB}$) and/or a derivative thereof (p. 24, lines 10-13, *'Based on these log filter-bank spectra, both the full-band features and sub-bands features were calculated. The full-band features were used for comparison, '*);

ix. deriving an overall likelihood (B) for occurrences of speech elements (P 1, ..., Pm) or of sequences thereof within said speech signal (S) based on said band-dependent likelihoods (b_1, ..., b_N) and said full-band likelihood (B_{FF}; B_{SSUB}) (p. 19, line 24 - p. 20, line 24).

Claim 2: **Ming** discloses a method as per claim 1 above, further comprising when deriving said overall likelihood (B) said band-dependent likelihoods (b_1, ..., b_N) are combined to a union model likelihood ($B_{U,MFCC}$) determining the number of uncorrupted

frequency sub-bands of said frequency sub-bands (F_1, ..., F_N), and adding all possible combinations of products of different band-dependent likelihoods (b_1, ..., b_N) corresponding to respective frequency sub-bands (p. 19, line 24 - p. 20, line 24).

Claim 3: **Ming** discloses a method as per claim 1 above, further comprising when said band-dependent acoustic feature data (O_1, ..., O_N) comprise respective band-dependent mel-frequency cepstral coefficient features, which are based on mel-frequency cepstral coefficients or a derivative thereof derived from respective frequency sub-bands (F_1, . . ., F_N) (p. 25, lines 10-15).

Claim 4: **Ming** discloses a method as per claim 1 above, further comprising, a predetermined broadband noise robustness technique (e.g. spectral subtraction, frequency filtering) is applied prior to deriving said full-band likelihood term (B_{FF}; B_{SSUB}) (p. 30, lines 16-21, *'was then used to build a Wiener filter, derived from spectral subtraction to enhance the noisy signal before recognition.'* [emphasis supplied]).

Claim 5: **Ming** discloses a method as per claim 4 above, further comprising wherein said broadband noise robustness technique is based on a frequency-filtering technique (p. 30, lines 12-14).

Claim 6: **Ming** discloses a method as per claim 4 above, further comprising wherein said broadband noise robustness technique is based on a method of spectral-subtraction (p. 30, lines 16-21, *'was then used to build a Wiener filter, derived from spectral subtraction to enhance the noisy signal before recognition.'* [emphasis supplied]).

Claim 9: **Ming** discloses a method as per claim 1 above, further comprising wherein said full-band acoustic feature data (FBE-F; FFBE; FBE-F-SSUB; $O_{F,SSUB}$) comprise full-band

mel-frequency cepstral coefficient features, which are based on mel-frequency cepstral coefficients or a derivative thereof de-rived from said entire spectrum (F) (p. 24, lines 8-16).

Claim 11: **Ming** discloses a method as per claim 1 above, further comprising when said full-band acoustic feature data (FBE; FFBE; FBE-F-SSUB; $O_{F,SSUB}$) comprise spectrally changed full-band mel-frequency cepstral coefficient features ($O_{F,SSUB}$), which are generated by applying a method of spectral subtraction (p. 30, lines 16-21, *'was then used to build a Wiener filter, derived from spectral subtraction to enhance the noisy signal before recognition.'* [emphasis supplied]) to said full-band mel-frequency cepstral coefficient features (O_F). (p. 25, lines 10-15).

Claim 12: **Ming** discloses a method as per claim 1 above, further comprising wherein said band-dependent likelihoods (b_1, ..., b_N) and said likelihood term (B_{FF}; B_{SSUB}; $B_{U,FF}$) are determined using a probability estimator (p. 12, lines 1-8).

Claims 14-16: Claims 14-16 are similar in scope and content to that of claim 1 above and so therefore are rejected under the same rationale.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 7-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ming** in view of **K.K. Paliwal, 'On The Use of Filter-Bank Energies As Features For Robust Speech Recognition', August 1999; pp. 641-644** referred to as **Paliwal** hereinafter.

Claim 7: **Ming** discloses a method as per claim 1 above however failing to, but **Paliwal** does specifically disclose, a method comprising wherein said full-band acoustic feature data (FBE-F; FFBE; FBE-F-SSUB; $O_{F,SSUB}$) comprise filter bank energy features (FBE-F), which are based on filter bank energies derived from said entire spectrum (F) (Abstract).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Paliwal** in the method of **Ming** because **Paliwal** discloses a method that, after thorough experimentation, performs better by providing as good as or more accurate speech recognition results that methods currently used; for instance Mel-Frequency cepstral coefficients, which have some setbacks, such as: 1) They do not have any physical interpretation, and 2) Liftering of cepstral coefficients, found to be highly useful in the earlier dynamic warping-based speech recognition systems, has no effect in the recognition process when used with continuous observation Gaussian density hidden Markov models (HMMs) (p. 641, Introduction).

Claim 8: **Ming** discloses a method as per claim 1 above however failing to, but **Paliwal** does specifically disclose, a method comprising wherein said full-band acoustic feature data (FBE-F; FFBE; FBE-F-SSUB; $O_{F,SSUB}$) comprise filtered filter bank energy features (FBE-F), which are based on filter bank energies derived from said entire spectrum (F) (p. 641, Introduction).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Paliwal** in the method of **Ming** because of the reasons described above.

Claim 10: **Ming** discloses a method as per claim 1 above however failing to, but **Paliwal** does specifically disclose, a method comprising wherein said full-band acoustic feature data (FBE-F; FFBE; FBE-F-SSUB; $O_{F,SSUB}$) and/or said band dependent acoustic feature data ($O_1,...,O_N$) comprise PLP-linear prediction filter features, which are based on PLP-linear prediction filter coefficients (p. 643, *'We model the correlation among consecutive FBEs by a linear predictor (LP)... where ai, i = 1,2, p, are the LP coefficients.'*).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Paliwal** in the method of **Ming** because of the reasons described above.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ming** in view of **Nadeu et al., 'Time and Frequency filtering of filter-bank energies for robust HMM speech recognition', Speech Communication 34 (2001) 93-114** referred to as **Nadeu** hereinafter.

Claim 13: **Ming**, in view of **Paliwal** discloses a method as per claim 1 above however failing to, but **Nadeu** does specifically disclose, a method of frequency filtering (p. 98, Section 3.2) comprising wherein filtered frequency bank energies are determined by means of a suitable method, by utilizing weighted averages of spectral filter bank energy magnitudes in order to determine filtered frequency bank energies for given windowed speech frames (p. 95, Section 2.1).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Nadeu** in the method of **Ming** because **Nadeu** provides a frequency filtering method that is, 'a simple and effective operation that performs a combination

of decorrelation and liftering, while still maintaining the speech parameters in the frequency domain, so avoiding the disadvantages of cepstral coefficients that were listed in Section 3.1 [They do not lie in the frequency domain, so lacking a frequency meaning which may be useful, especially for implementing robust techniques; 2. As most current HMMs use Gaussian distributions with diagonal covariance matrices and ML-estimated standard deviations, those HMMs cannot benefit from a cepstral weighting (liftering), since any multiplying factor that is applied to the observations does not affect the Gaussian exponent calculation; 3. They require a DCT computation.].' (p. 104).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **Fiocca (USPN 5,625,743), Ono (USPN 5,583,888) and Kapust et al. (USPN 5,583,784)** all disclose frequency analysis methods utilized in speech recognition.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Justin W. Rider whose telephone number is (571) 270-1068. The examiner can normally be reached on Monday - Friday 7:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available

through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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04 June 2007

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